GradeMax

Pearson

Mark Scheme (Results)

Summer 2026

International Advanced Level in Decision Mathematics D1

WDM11/01

GradeMax

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2026
Question Paper Log Number P79478A
Publication Code WDM11_01_2606_MS
All the material in this publication is copyright
© Pearson

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a
  candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

General Instructions for Marking

1. The total number of marks for the paper is 75.
2. The Edexcel Mathematics mark schemes use the following types of marks:
   - **M** marks: Method marks are awarded for 'knowing a method and attempting to apply it', unless otherwise indicated.
   - **A** marks: Accuracy marks can only be awarded if the relevant method (M) marks have been earned.
   - **B** marks are unconditional accuracy marks (independent of M marks) Marks should not be subdivided.

3. Abbreviations
   These are some of the traditional marking abbreviations that will appear in the mark schemes and can be used if you are using the annotation facility on ePEN:
   - bod – benefit of doubt
   - ft – follow through
   - the symbol $\surd$ will be used for correct ft
   - cao – correct answer only
   - cso – correct solution only. There must be no errors in this part of the question to obtain this mark
   - isw – ignore subsequent working
   - awrt – answers which round to
   - SC – special case
   - oe – or equivalent (and appropriate)
   - d… or dep – dependent
   - indep – independent
   - dp – decimal places
   - sf – significant figures
   - * – The answer is printed on the paper or ag- answer given

- ⌐ or d... – The second mark is dependent on gaining the first mark

4. All A marks are 'correct answer only' (cao), unless shown, for example, as A1 ft to indicate that previous wrong working is to be followed through. After a misread however, the subsequent A marks affected are treated as A ft, but manifestly absurd answers should never be awarded A marks.

5. For misreading which does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, in that part of the question affected. If you are using the annotation facility on ePEN, indicate this action by 'MR' in the body of the script.

6. If a candidate makes more than one attempt at any question:

a) If all but one attempt is crossed out, mark the attempt which is NOT crossed out.

b) If either all attempts are crossed out or none are crossed out, mark all the attempts and score the highest single attempt.

Ignore wrong working or incorrect statements following a correct answer.

<table>
<tr><th>Question Number</th><th>Scheme</th><th>Marks</th></tr>
<tr><td>1.(a)</td><td>$\frac{24+16+34+21+38+12+31+5+9+14+23}{60} = \frac{227}{60} = 3.78\ldots$
therefore 4 bins</td><td>M1
A1 (2)</td></tr>
<tr><td>(b)</td><td>Bin 1: 24 16 <u>12</u> <u>5</u>
Bin 2: 34 21
Bin 3: 38 9
Bin 4: <u>31</u> 14
Bin 5: 23</td><td>M1 <u>A1</u> A1(3)</td></tr>
<tr><td>(c)</td><td>
<table>
<tr><td>24</td><td>16</td><td>34</td><td>21</td><td>38</td><td>12</td><td>31</td><td>5</td><td>9</td><td>14</td><td>23</td></tr>
<tr><td>24</td><td>34</td><td>21</td><td>38</td><td>16</td><td>31</td><td>12</td><td>9</td><td>14</td><td>23</td><td>5</td></tr>
<tr><td>34</td><td>24</td><td>38</td><td>21</td><td>31</td><td>16</td><td>12</td><td>14</td><td>23</td><td>9</td><td>5</td></tr>
<tr><td>34</td><td>38</td><td>24</td><td>31</td><td>21</td><td>16</td><td>14</td><td>23</td><td>12</td><td>9</td><td>5</td></tr>
<tr><td>38</td><td>34</td><td>31</td><td>24</td><td>21</td><td>16</td><td>23</td><td>14</td><td>12</td><td>9</td><td>5</td></tr>
<tr><td>38</td><td>34</td><td>31</td><td>24</td><td>21</td><td>23</td><td>16</td><td>14</td><td>12</td><td>9</td><td>5</td></tr>
<tr><td>38</td><td>34</td><td>31</td><td>24</td><td>23</td><td>21</td><td>16</td><td>14</td><td>12</td><td>9</td><td>5</td></tr>
<tr><td>38</td><td>34</td><td>31</td><td>24</td><td>23</td><td>21</td><td>16</td><td>14</td><td>12</td><td>9</td><td>5</td></tr>
</table>
<table>
<tr><td>24</td><td>16</td><td>34</td><td>21</td><td>38</td><td>12</td><td>31</td><td>5</td><td>9</td><td>14</td><td>23</td></tr>
<tr><td>38</td><td>24</td><td>16</td><td>34</td><td>21</td><td>31</td><td>12</td><td>23</td><td>5</td><td>9</td><td>14</td></tr>
<tr><td>38</td><td>34</td><td>24</td><td>16</td><td>31</td><td>21</td><td>23</td><td>12</td><td>14</td><td>5</td><td>9</td></tr>
<tr><td>38</td><td>34</td><td>31</td><td>24</td><td>16</td><td>23</td><td>21</td><td>14</td><td>12</td><td>9</td><td>5</td></tr>
<tr><td>38</td><td>34</td><td>31</td><td>24</td><td>23</td><td>16</td><td>21</td><td>14</td><td>12</td><td>9</td><td>5</td></tr>
<tr><td>38</td><td>34</td><td>31</td><td>24</td><td>23</td><td>21</td><td>16</td><td>14</td><td>12</td><td>9</td><td>5</td></tr>
<tr><td>38</td><td>34</td><td>31</td><td>24</td><td>23</td><td>21</td><td>16</td><td>14</td><td>12</td><td>9</td><td>5</td></tr>
</table>
</td><td>M1
A1
A1ft
A1
(4)</td></tr>
<tr><td>(d)</td><td>Bin 1: 38 21
Bin 2: 34 24
Bin 3: 31 23 5
Bin 4: 16 14 12 9</td><td>M1 A1(2)</td></tr>
<tr><td></td><td></td><td>11 marks</td></tr>
<tr><td></td><td>Notes for Question 1</td><td></td></tr>
<tr><td>a1M1</td><td>A correct lower bound calculation (accept awrt 3.78 without seeing the full calculation) Accept (227 +/- 38)/60</td><td></td></tr>
<tr><td>a1A1</td><td>CAO – 4 bins from a correct calculation. Note a lower bound of 4 without a correct calculation or 3.78 seen scores M0. Do not award if any incorrect working seen</td><td></td></tr>
<tr><td>b1M1</td><td>The correct first five items placed correctly (the bold values) and at least eight values placed in bins (allow repeated values). Condone cumulative totals throughout for M1 only</td><td></td></tr>
<tr><td>b1A1</td><td>First eight values placed correctly (the bold and underlined values) with all eleven correct values only placed in bins. This mark cannot be awarded if any</td><td></td></tr>
</table>

Question Number	Scheme	Marks
	repeated values or incorrect values are seen (even if the first eight values have been placed correctly)	
b2A1	CSO – no additional or repeated values (dependent on both previous marks)	
c1M1	Bubble sort into descending order, either right to left with smallest item (5) correctly positioned, or left to right with largest item (38) correctly positioned. (Condone one item error or omission). **Special Case** Ascending order is M1 per the main scheme A1 for a fully correct sort then A0 A0 even if the list is reversed. See below. Quick sort M0	
c1A1	First and second passes correct	
c2A1ft	Third, fourth and fifth passes correct following through from their second pass	
c3A1	CSO (correct solution only – all previous marks in this part **must** have been awarded) including a final pass with no changes	
d1M1	**Their** seven largest items placed correctly and at least nine values placed in bins (if correct this will be the bold items but must check **their** packing if any of **their** seven largest values are incorrect – note that the maximum weight of a bin is 60). Condone cumulative totals for M1 only. First-fit increasing scores no marks in this part. If no sort seen in (c) then mark (d) assuming the correct ordered list is being used	
d1A1	CAO	

Ascending left to right (M1 A1 A0 A0 if fully correct)

24	16	34	21	38	12	31	5	9	14	23
16	24	21	34	12	31	5	9	14	23	38
16	21	24	12	31	5	9	14	23	34	38
16	21	12	24	5	9	14	23	31	34	38
16	12	21	5	9	14	23	24	31	34	38
12	16	5	9	14	21	23	24	31	34	30
12	5	9	14	16	21	23	24	31	34	38
5	9	12	14	16	21	23	24	31	34	38
5	9	12	14	16	21	23	24	31	34	38

Ascending right to left (M1 A1 A0 A0 if fully correct)

24	16	34	21	38	12	31	5	9	14	23
5	24	16	34	21	38	12	31	9	14	23
5	9	24	16	34	21	38	12	31	14	23
5	9	12	24	16	34	21	38	14	31	23
5	9	12	14	24	16	34	21	38	23	31
5	9	12	14	16	24	21	34	23	38	31
5	9	12	14	16	21	24	23	34	31	38
5	9	12	14	16	21	23	24	31	34	38
5	9	12	14	16	21	23	24	31	34	38

<table>
<tr><th>Question Number</th><th>Scheme</th><th>Marks</th></tr>
<tr><td>2.(a)</td><td>
<table>
<tr><td>A</td><td>B</td><td>C</td><td>D</td><td>Is $-0.1<D<0.1$?</td></tr>
<tr><td>1250</td><td>125</td><td>67.5</td><td>57.5</td><td>no</td></tr>
<tr><td></td><td>67.5</td><td>43.009</td><td>24.491</td><td>no</td></tr>
<tr><td></td><td>43.009</td><td>36.036</td><td>6.973</td><td>no</td></tr>
<tr><td></td><td>36.036</td><td>35.362</td><td>0.675</td><td>no</td></tr>
<tr><td></td><td>35.362</td><td>35.355</td><td>0.006</td><td>yes</td></tr>
</table>
</td><td>M1

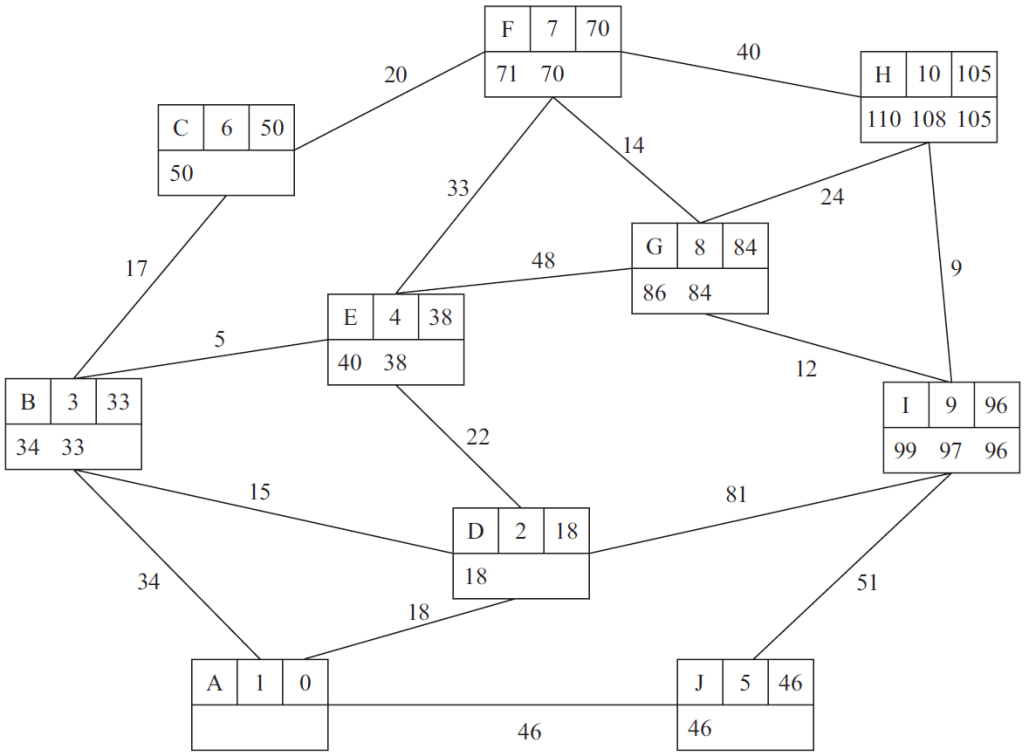
A1

A1ft</td></tr>
<tr><td></td><td>Output 35.355</td><td>A1 (4)</td></tr>
<tr><td>(b)</td><td>Calculates the square root of a number or states $\sqrt{A}$</td><td>B1 (1)</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>5 marks</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>Notes for Question 2</td><td></td></tr>
<tr><td></td><td>Condone
1250 repeatedly written in”A” column.
67.500 and 57.500
“no” replaced with crosses and “yes” replaced with a tick.
3dp answers given to more decimal places provided their answer rounds correctly to 3dp
If “no” is omitted throughout, but all other cells correct award M1 A0 A1 A0.</td><td></td></tr>
<tr><td>a1M1</td><td>First row cells completed – something in each cell A to D.</td><td></td></tr>
<tr><td>a1A1</td><td>First second and third row correct.</td><td></td></tr>
<tr><td>a2A1ft</td><td>Fourth and fifth rows correct – ft their third row.</td><td></td></tr>
<tr><td>a3A1</td><td>CSO 35.355 in Output row. Condone if “output 35.355” seen elsewhere</td><td></td></tr>
<tr><td>b1B1</td><td>CAO Square Root or $C^2 = A$. Give BOD if equivalent answer given numerically or in words</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>Alternative using correct fractions:
These exact fractions are correct replacements for the two exact numbers and the two numbers to 3dp

67.5 = 135/2 57.5 = 115/2 43.009 = 4645/108 24.491 = 2645/108

Alternative if using all values rounded to 3 dp (scores full marks)

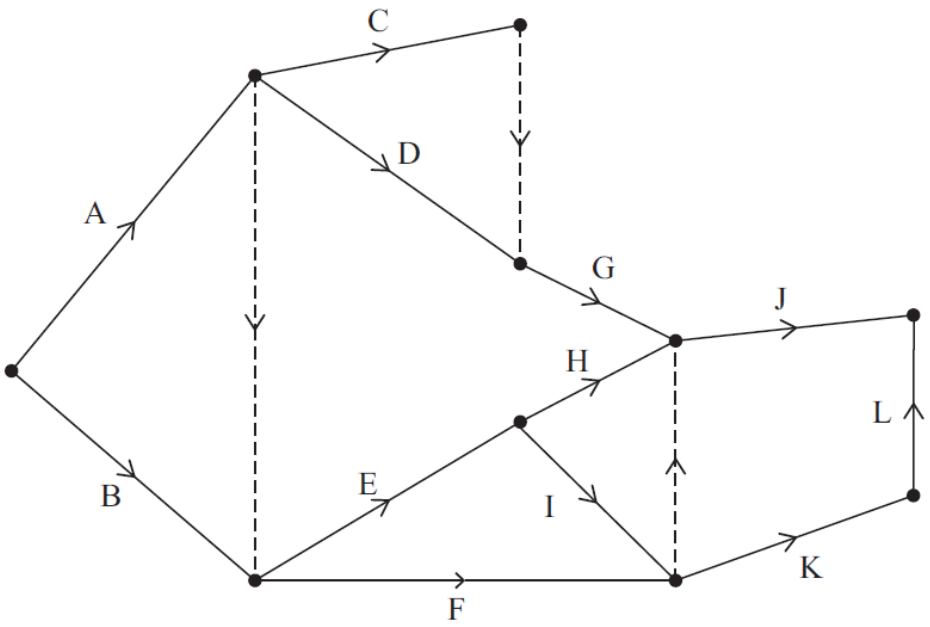
<table>
<tr><td>A</td><td>B</td><td>C</td><td>D</td><td>Is $-0.1<D<0.1$?</td></tr>
<tr><td>1250</td><td>125</td><td>67.5</td><td>57.5</td><td>no</td></tr>
<tr><td></td><td>67.5</td><td>43.009</td><td>24.491</td><td>no</td></tr>
<tr><td></td><td>43.009</td><td>36.036</td><td>6.973</td><td>no</td></tr>
<tr><td></td><td>36.036</td><td>35.362</td><td>0.674</td><td>no</td></tr>
<tr><td></td><td>35.362</td><td>35.355</td><td>0.007</td><td>yes</td></tr>
</table>
</td><td></td></tr>
</table>

Question Number	Scheme	Marks
3. (a)	Semi-Eulerian as there are (exactly) two odd nodes	B1 **(1)**
(b) (i)		M1 A1 A1 A1ft
	Shortest time from A to H is 105 (minutes)	A1ft
(b) (ii)	Quickest route is ADBCFGIH	A1 **(6)**
(c)	New route is ADBEFGIH (106)	M1
	Increase is 106 – 105 = 1 (minute)	A1ft **(2)**
		9 Marks

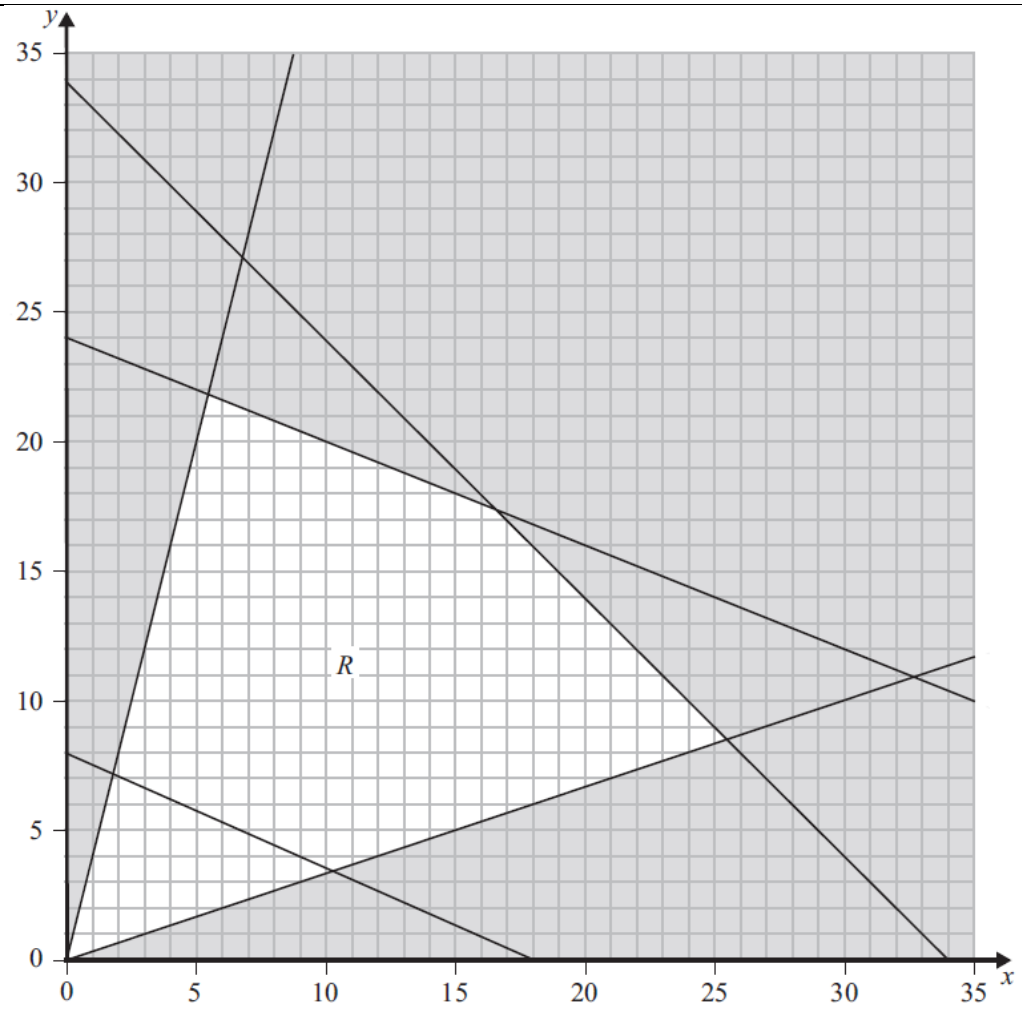
	Notes for Question 3
aB1	CAO with correct reason – two odd nodes oe Accept A and H odd.
	In (b) it is important that all values at each node are checked very carefully – the order of the working values must be correct for the corresponding A mark to be awarded e.g. at I the working values must be 99 97 96 in that order (so 99 96 97 is incorrect) **It is also important that the order of labelling is checked carefully. The order of labelling must be a strictly increasing sequence – so 1, 2, 3, 3, 4, … will be penalised once (see notes below) but 1, 2, 3, 5, 6, … is fine. Errors in the final values and working values are penalised before errors in the order of labelling**
bi1M1	A larger value replaced by a smaller value at least twice in the working values at either B, E, F, G, H, I
bi1A1	All values at A, D, B, E and J correct and the working values in the correct order
bi2A1	All values at C, F and G correct and the working values in the correct order
bi3A1ft	All values at I and H correct on the follow through and the working values in the correct order.

	To follow through I check that the working values at I follow from the candidate's final values for the nodes that are directly attached to I (which are D, J and G (and H)). For example, **if** correct then the order of labelling of nodes D, J and G are 2, 5 and 8 respectively so the working values at I should come from D, J and G in that order. The first working value at I should be their 18 (the Final value at D) + 81 (the weight of the arc DI), the second working value at I should be their 46 (the Final value at J) + 18 (the weight of the arc JI) and the third working value should be their 84 (the Final value at G) + 12 (the weight of the arc GI) . Repeat the process for H (which will have working values from F, G and I with the order of these nodes determined by the candidate's order of labelling at F, G and I)
bi4A1ft	Follow through their final value at H **only** – if answer is 105 but the Final Value at H is not 105 then A0. Condone shortest time written on line below, swapped with quickest route
bii1A1	CAO Condone quickest route written on line above
c1M1	Identifies the correct new shortest route or part of this route to include BEF ie ADBEFGIH (106) or ADBEF (71) or BEF (38). Must not be using any route other than ADBEFGIH and must be implying an increase. Numbers need not be seen for this mark. (No increase implies M0)
c1A1ft	Increase of 1 ft (minute) with number for comparison (eg 106, 71 or 38) We do not need to see a calculation as their 105, 70 and 37 are implied from (b). If ft an increase must result.

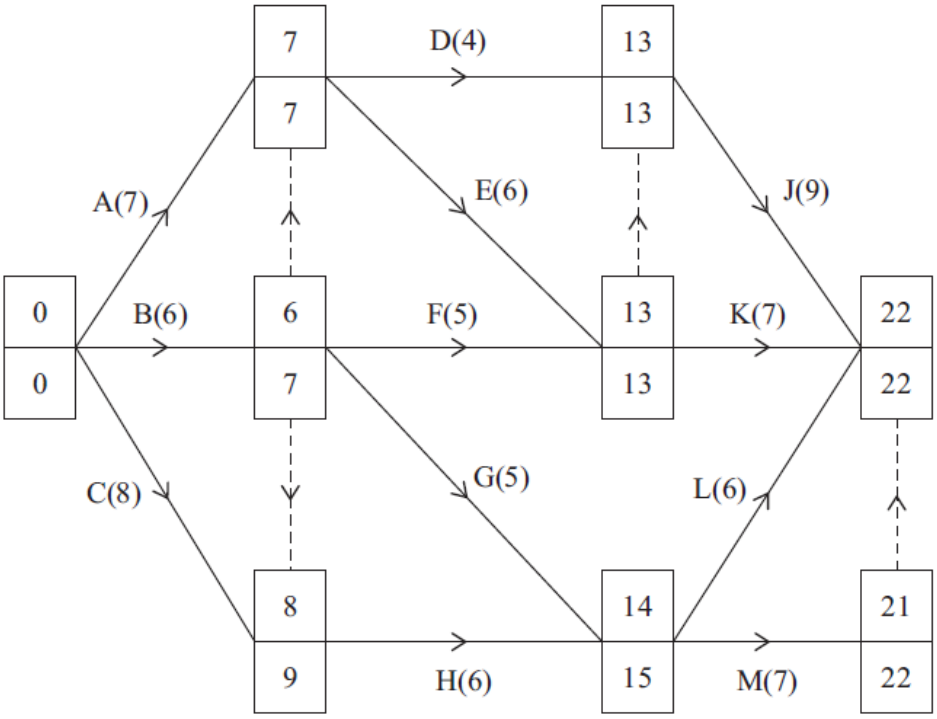
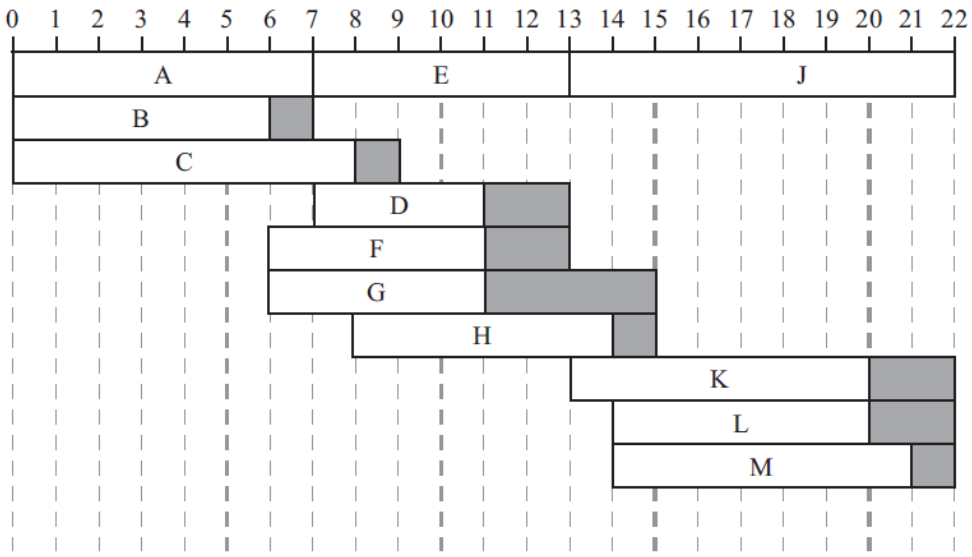
Question Number	Scheme	Marks
4.(a)	AGFEDCBHA $14x + 177$	M1 A1 A1
		(3)
(b)	$6x + 7 > 34$ *or* $8x - 2 > 34$ (accept $\geq$) ($\Rightarrow x > 4.5$) $14x + 177 < 256$ ($\Rightarrow x < 5.64\ldots$) $x = 5$	B1 M1 A1
		(3)
(c)	RMST $27 + 28 + 25 + 30 + 31 + 34\ (= 175)$ Plus two shortest from A (28 and 29) Lower bound 232 (miles)	B1 M1 A1
		(3)
(d)	$232 \leqslant L \leqslant 247$	B1
		(1)
		10 marks
	Notes for Question 4	
a1M1	**Mark (a) and (b) together.** NN route attempted – first six nodes correct AGFEDC (accept arcs for this mark, so first five arcs correct AG GF FE ED DC) (if no route stated accept numbers across the top of the table 1, -, 6, 5, 4, 3, 2, -)	
a1A1	CAO – route correct (accept arcs AG GF FE ED DC CB BH HA) (do not accept top of graph numbers for this mark)	
a2A1	CAO – distance $14x + 177$	
b1B1	Compares AH or BH and HG to form correct inequality	
b1M1	Forms an inequality using "answer to (a)" < 256	
b1A1	CAO $x = 5$ following from $177 + 14x < 256$ plus at least one of the other correct inequalities	
c1B1	Finds the "RMST" (may list lengths of arcs or name arcs or circle correct figures on the table or sight of 175) Correct arcs are BC BE ED EF FG GH	
c1M1	Adds the two shortest arcs from A (sight of AG and AD or 28 and 29) to their RMST, which must comprise six arcs	
c1A1	CAO 232 (Do not accept 232 with no working)	
d1B1	CAO – Accept strict inequalities. Accept interval notation	

Question Number	Scheme	Marks
5.(a)	e.g.  	M1 A1 A1 A1 A1 **(5)**
(b)	Activities A, B, E, I, K and L are critical	B1 **(1)**
		6 marks
	Notes for Question 5	
	Activity on node is M0 Condone lack of, or incorrect, numbered events throughout. 'Dealt with correctly' means that the activity starts from the correct event but need not necessarily finish at the correct event, e.g. 'G dealt with correctly' requires the correct precedences for this activity, i.e. C and D labelled correctly, with a dummy from the end of C into the same node as D and G starting from that node but do not consider the end event.	
	If an arc is not labelled, for example, if the arc for activity E is not labelled (but the arc is present) then this will lose the first A mark and the final (CSO) A mark – they can still earn the second and third A marks on the bod. If two or more arcs are not labelled then mark according to the scheme. Assume that a solid line is an activity which has not been labelled rather than a dummy (even if in the correct place for where a dummy should be). **Ignore incorrect or lack of arrows on the activities for the first four marks only**	
a1M1	Eight activities (labelled on arc), one start and at least two dummies placed	
a1A1	Activities A, B, C, 1st dummy, from A to B (including correct arrow), D, E and F dealt with correctly	
a2A1	2nd dummy, between C and D (including correct arrow), activities G, H and I dealt with correctly	
a3A1	Activities J, K and L dealt with correctly, so 3rd dummy at the end of F and I required + correct arrow	
a4A1	CSO – all arrows correctly placed for each activity with one finish and exactly three dummies	

	Please check all arcs carefully for arrows – if there are no arrows on any dummies then M1 only. **Note that additional (but unnecessary) 'correct' dummies that still maintain precedence for the network should only be penalised with the final CSO A mark if earned. Note that this answer is not unique. There are many ways of drawing this network that are isomorphic to this version. Condone arcs drawn crossing other arcs.**	
b1B1	CAO	

Question Number	Scheme	Marks
6. (a)	$x + y \leqslant 34$ $12x + 30y \leqslant 720 \quad \Rightarrow \quad 2x + 5y \leqslant 120$	B1 M1 A1 **(3)**
(b)	 	B1 dB1
		(2)
(c)	Objective line drawn Optimal vertex at $\left(16\frac{2}{3},\ 17\frac{1}{3}\right)$ identified 17 small clocks and 17 large clocks	M1 A1 A1
		(3)
(d)	$12 \times 60 - 17 \times 12 - 17 \times 30 = 6$ minutes	B1
		(1)
		9 marks

	Notes for Question 6	
a1B1	CAO	
a1M1	Forms inequality using time information – accept $<$ $\leqslant$ or $=$ for this mark	
a1A1	CAO – fully simplified	
b1B1	Both lines drawn ($2x + 5y = 120$, extended if necessary, should pass through (0, 24) and (20, 16), and $x + y = 34$ should pass through (0, 34) and (34, 0). Both lines must be accurately plotted to within one small square). If the lines do not reach the boundary of the graph paper they must start/finish at least within the given shaded area	
b2B1	Correct region identified with *R* written (dependent on previous B mark) added shading not required	
c1M1	Correct objective line drawn (minimum passes through (0, 2) and (4.5, 0)) or line with reciprocal gradient (correct gradient can be checked using ePen line tool)	
c1A1	Optimal point identified (dependent on correct objective line and correct *R*) indicated by label on the graph or coordinates which round to (17,17). (Note that (16,17) is incorrect)	
c2A1	CAO but must be in context so $x = 17$ and $y = 17$ is A0	
d1B1	CAO including minutes with no incorrect working seen. Accept time 0.1 hours	

Question Number	Scheme	Marks
7.		
(a)		M1 A1 M1 A1 **(4)**
(b)	Float $22 - 14 - 7 = 1$	B1 **(1)**
(c)	$\frac{7+6+8+4+6+5+5+6+9+7+6+7}{22} = \frac{76}{22} = 3.45...$ 4 workers required	M1 A1 **(2)**
(d)		M1 A1 A1 A1 **(4)**
(e)	At time $10 < t < 11$ activities D, E, F, G and H must be happening. Therefore five workers required	M1 A1 **(2)**
(f)	e.g. H will now finish at time 17, which is the start time for L and M. M will finish at time 24 delaying the project by 2 days.	M1 A1 **(2)**

		15 marks
	Notes for Question 7	
a1M1	**All** top boxes complete, values generally increasing in the direction of the arrows ('left to right'), condone one rogue	
a1A1	CAO (top boxes)	
a2M1	**All** bottom boxes complete, values generally decreasing in the opposite direction of the arrows ('right to left'), condone one rogue. Condone missing 0 and/or their 22 (at the end event) for the M mark only	
a2A1	CAO (bottom boxes)	
b1B1	CAO Correct calculation seen	
c1M1	(76 +/-9)/"22" a calculation using the sum of the activity times divided by their finish time or sight of awrt 3.45	
c1A1	CAO 4 (workers), no incorrect working seen. An answer of 4 with no working is M0	
d1M1	Cascade Chart not a schedule. At least 9 activities including at least 4 floats	
d1A1	Critical activities and at least 3 non-critical activities correct	
d2A1	At least 7 non-critical activities correct	
d3A1	CAO All 12 activities present (just once). No errors**.**	
e1M1	Either a statement with the correct number of workers (5) and stating the correct activities (D, E, F, G and H) with any numerical time stated **or** the correct number of workers (5) and a time in the interval $10 \leq t \leq 11$ – mark the numerical value only not their use of the words 'day/time' (or equivalent)	
e1A1	A completely correct statement with details of both time **and** activities. Candidates must give a time within the correct interval of $10 < t < 11$, e.g. 10.5 (or 'on/during day 11') and state the correct activities (D, E, F, G and H). Please note inequalities for the time interval implying a time of 10 is incorrect. Answers given as an interval of time are acceptable provided the time interval stated is correct for all its possible values (e.g. time 10 – 11 or 'between 10 and 11' is A0). A completely correct statement with an additional incorrect statement scores A0 (so do not ignore subsequent working)	
f1M1	Considers the effect of the delay on H and hence on (L and) M. Could refer to start/ finish times 11/17 and 24, but, if purely numerical, there must be at least two of these three figures.	
f1A1	CAO – project delayed by 2 days with explicit reference to a time for H (start 11 or finish 17) and explicit reference to M and time 24.	

Question Number	Scheme	Marks
8.(a)	Yes – it is a **finite sequence of edges**, with the **end vertex of one edge the start vertex of the next** and **no vertex appears more than once**. Or Yes – as it is **a walk** with **no vertex repeated.**	B1 B1 **(2)**
(b)	Possible pairings QS + RT (not possible as minimum 4 arcs) QR + ST (either 2 or 3 arcs) QT + RS (either 2 or 3 arcs)	B1
	QR using 2 arcs $(x + 8) + (2x + 1) < 4x + 4$ or $3x + 9 < 4x + 4$ or $3x + 34 < 4x + 29$ $x > 5$ RS using 2 arcs $(3x + 1) + (2x - 1) < 4x + 8$ or $5x < 4x + 8$ or $5x + 22 < 4x + 30$ $x < 8$	M1 A1 M1 A1
	$(5 < x < 8)$	**(5)**
(c)	$5x + 22 = 3x + 34$ or $21x + 257 = 19x + 269$ $x = 6$ Length = 383 (m)	M1 A1 A1
		(3)
		10 Marks

	Notes for Question 8
a1B1	Yes plus reason – must mention, or imply, sequence of edges and no vertex repeated, but be generous and give BOD, or mentions walk and indicates no vertex repeated
a2B1	CAO – must include the three statements in bold or both a walk and no vertex repeated
b1B1	**Ignore labelling (a), (b) and (c) and give credit wherever correct working is seen.** Considers 3 possible pairings of odd nodes Q, R, S and T (QS & RT may be seen crossed out as are 4 arcs minimum)
b1M1	Forms an inequality with QM + MR < QR
b1A1	CAO $x > 5$
b2M1	Forms an inequality with RP + PS < RS
b2A1	CAO $x < 8$ (note combined inequality not required)
c1M1	Forms an equation using the correct possible repeats, which may include network length. (Equation formed from RPS + QT = QMR + ST)
c1A1	CAO x
c2A1	CAO the length of the route